Supporting Information:

RSC Advances

Paper

Highly sensitive and wearable gas sensors consisting of chemically functionalized graphene oxide assembled on cotton yarn

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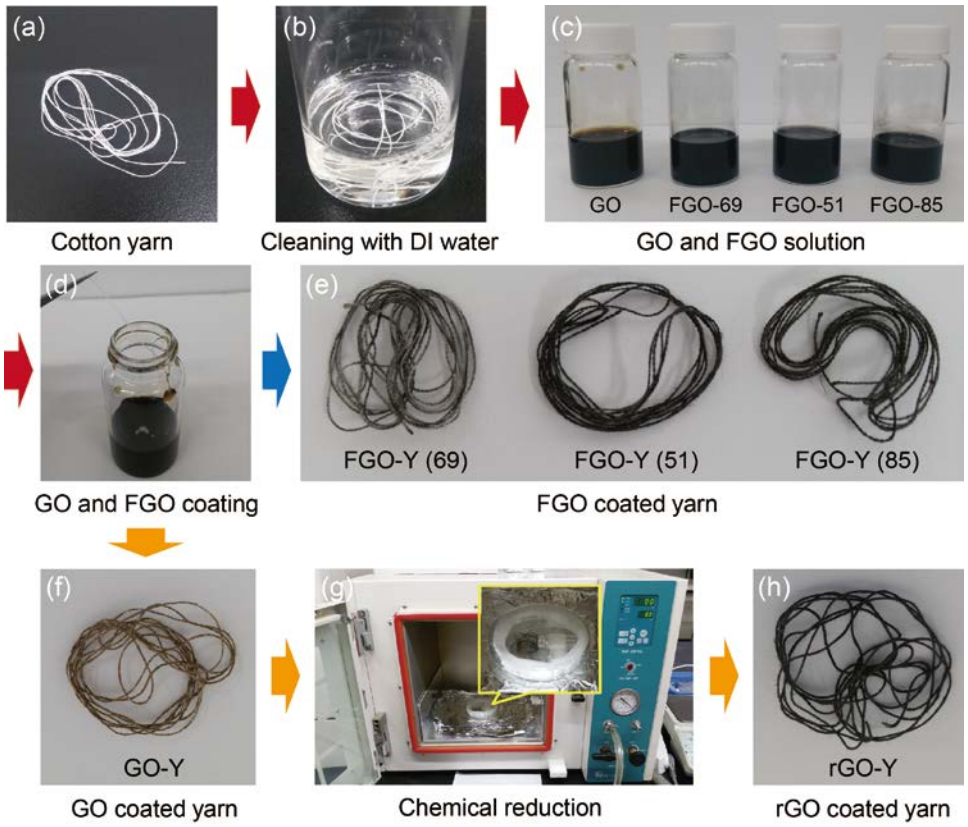

Figure S1. Process schematic diagram of rGO and FGO coated on a single yarn fabric

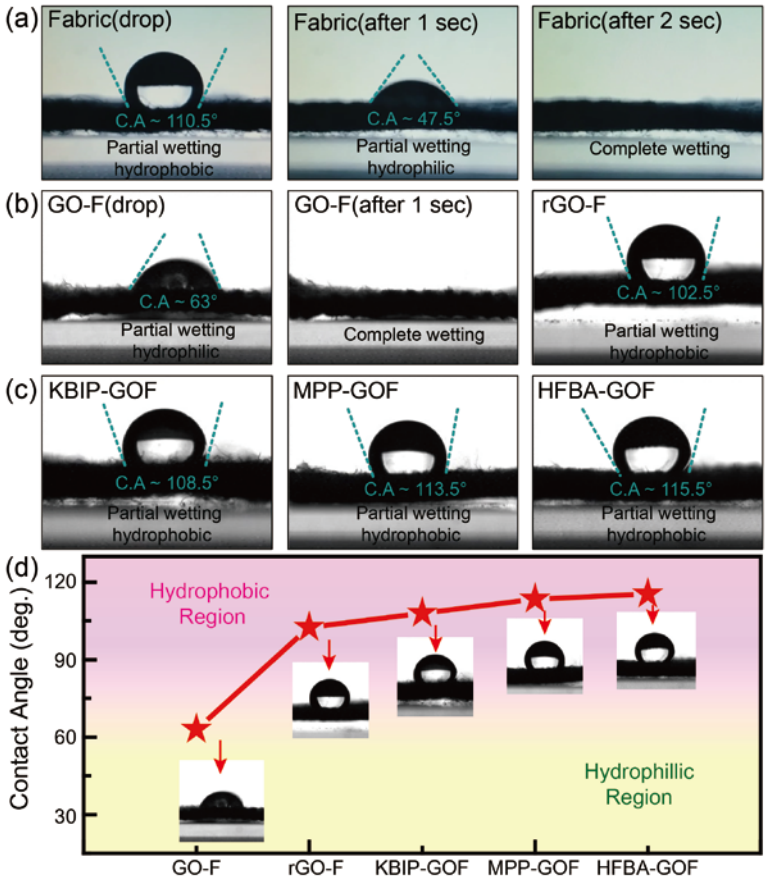

Figure S2. (a) Photographs and contact angles of deionized water droplets on a pure fabric substrate, (b) GO- and rGO-coated fabric substrate, (c) FGO-coated fabric substrate, (d) the measured contact angles for GO-F, rGO-F, KBIP-GO-F, MPP-GO-F, and HFBA-GO-F indicating that the hydrophobic natures of rGO-F and FGO-F are observed except in the case of GO-F.

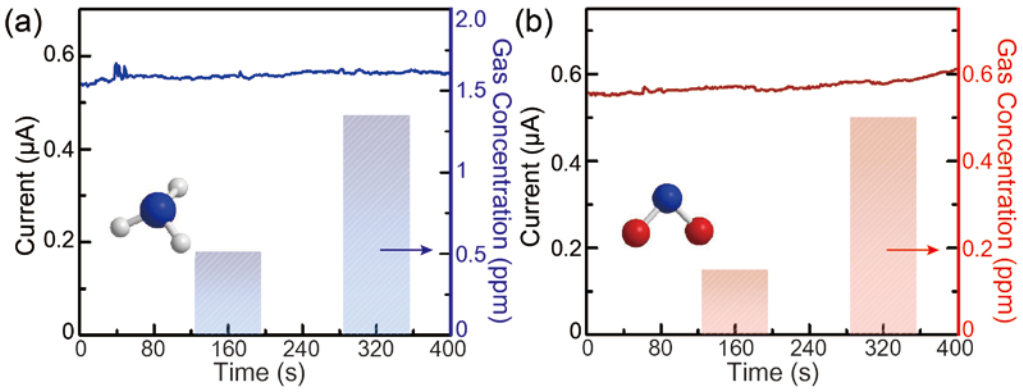

Figure S3. Gas response to the injection of (a) NH_3 gas and (b) NO_2 gas with carbon tape as the electrode

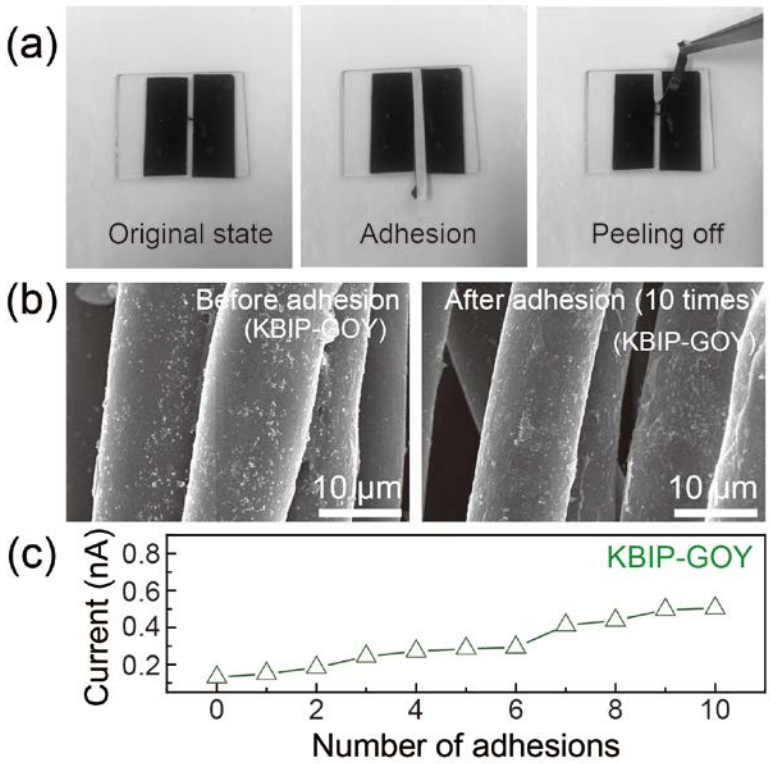

Figure S4. Tape adhesion test of FGO coated on the single yarn. (a) Real image of tape adhesion test process, (b) SEM images of FGO coated on the single yarn before and after taping process with carbon adhesive tapes, (c) electrical properties as a function of number of adhesions

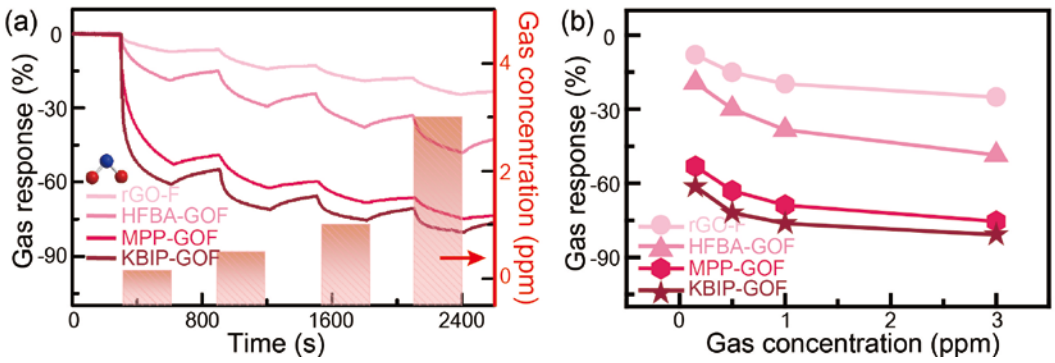

Figure S5. (a) Real-time gas sensing response to NO_2 at room temperature under various gas exposure conditions. (b) Gas response of rGO and FGO on yarn fiber to NO_2 molecules as a function of gas concentration.

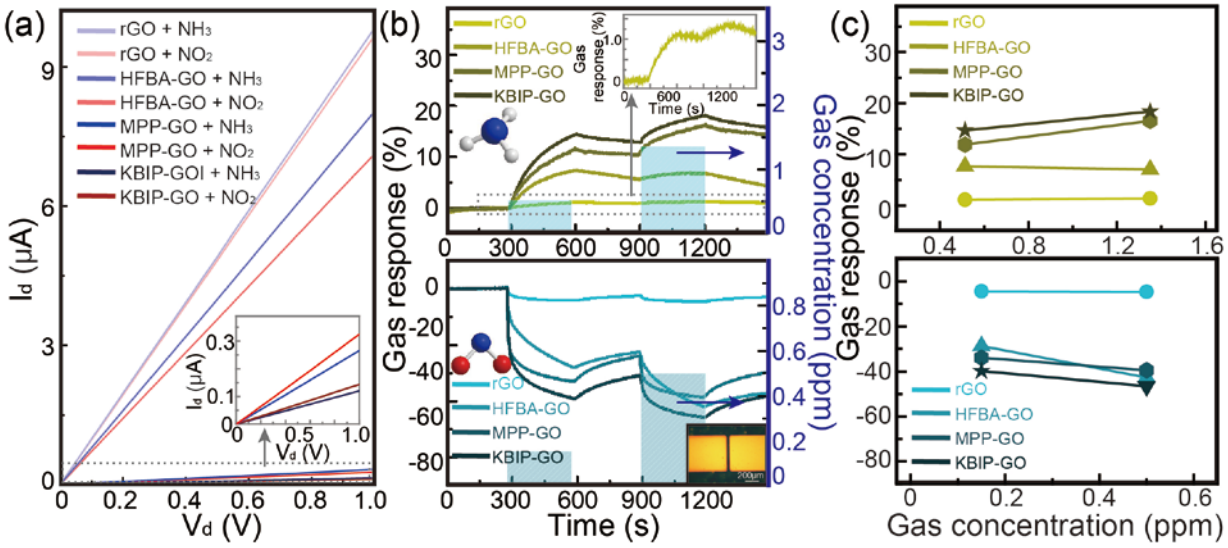

Figure S6. (a) Output characteristics of rGO, HFBA-GO, MPP-GO, and KBIP-GO thin films under exposure to NH_3 and NO_2. (b) Time-dependent gas response of thin-film-type rGO- and FGO-based devices under exposure to NO_2 and NH_3. (c) Gas response of rGO and FGO thin films depending on gas concentration.

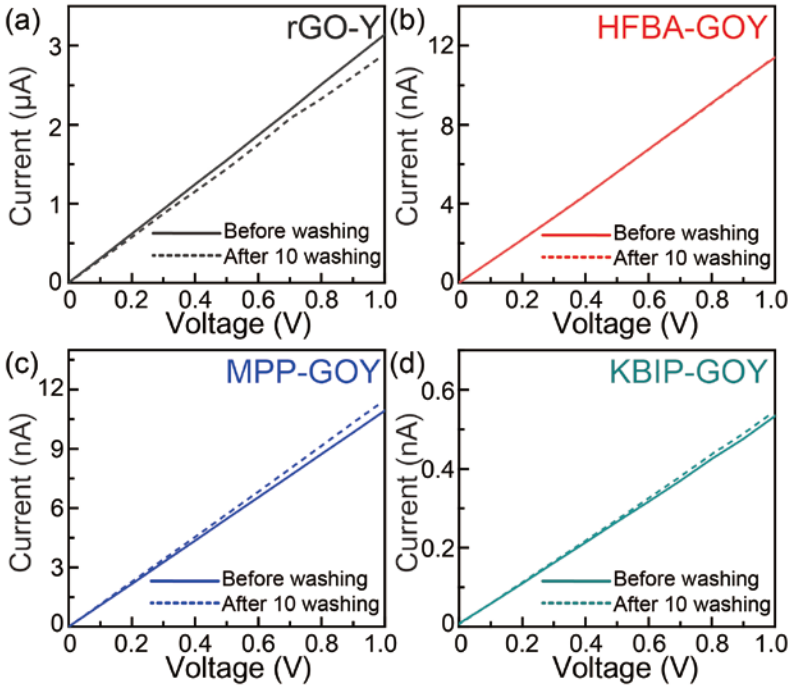

Figure S7. Output curves of (a) rGO-Y, (b) HFBA-GO-Y, (c) MPP-GO-Y, and (d) KBIP-GO-Y before and after 10 cycles of washing.

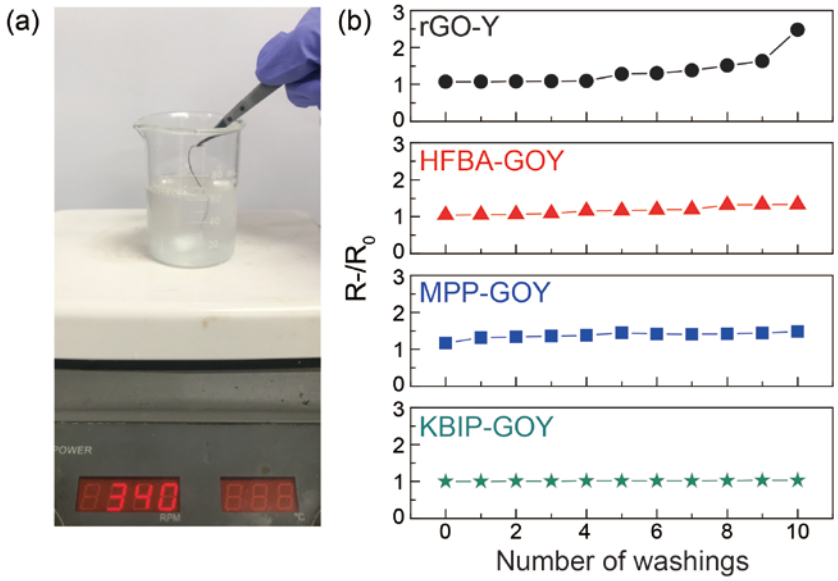

Figure S8. (a) Photograph of the washing test using commercially available detergents, (b) The resistance variation of fiber-type sensors based on FGO and rGO.

Experimental procedures of laundry process. rGO-Y, KBP-GO-Y, MPP-GO-Y, and HFBA-GO-Y was soaked in a beaker containing deionized water (60 ml) and commercially available detergents (Power Clean Total Care, 0.12g). The principal ingredients of synthetic detergents are linear alkylbenzenes (anion), high-alcohol surfactant (non-ion), fatty acid surfactant (anion), protease. Then, rGO-Y, KBP-GO-Y, MPP-GO-Y, and HFBA-GO-Y was stirred in the as-prepared solution at 340 rpm for 30 min and rinsed thoroughly with deionized water. Subsequently, drying process was performed in the desiccator for 3 hours.